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**U.S. Army Infantry Human Research Unit
Fort Benning, Georgia**

Under the Technical Supervision of

**The George Washington University
HUMAN RESOURCES RESEARCH OFFICE
operating under contract with
THE DEPARTMENT OF THE ARMY**

This is a report of the results of the research conducted by the Human Research Unit, Fort Benning, Georgia, in the development of a new type of small arms target. The research was conducted by the Human Research Unit, Fort Benning, Georgia, and Development, Department of the Army.

RESEARCH MEMORANDUM

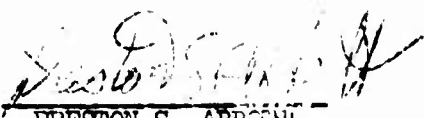
RIFLEMAN II.
AN ADVANCING SMALL ARMS TARGET.

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March 1959

30p

Approved:


PRESTON S. ABBOTT
Director of Research

U.S. Army Infantry
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COMPOSITION OF THE RESEARCH TEAM

This research was done while John E. Taylor was Leader of Task RIFLEMAN. RIFLEMAN II Subtask Leader was Howard C. Sarvis; staff members were SP 4 Donald A. Haefner* and Pfc Francis J. Tomcykowski.*

Mechanical design experiments and fabrication of components were performed in the USAIHRU Developmental Engineering Section under the direction of Gordon O. Gay, assisted by Lyman K. Harris.

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RIFLEMAN II
AN ADVANCING SMALL ARMS TARGET

INTRODUCTION

The device discussed in this report was developed to provide a suitable target for training soldiers to engage close-in, approaching targets with small arms fire.

The absence of suitable training devices and techniques has not permitted realistic training in the area of close combat firing. Lacking effective methods for simulating and practicing this type of training, it has traditionally been neglected or has been given only token consideration by employing such techniques as having opposing units maneuver against one another firing blanks. The firing of blanks does not get at the "close" aspect of combat in that the minimum safety ranges for firing blanks do not permit opposing sides to get near enough together to actually engage in close assault and defense firing. Also, this technique permits only "judgmental" scoring of the effectiveness of either side's activities.

The effective engagement of close combat targets may not be difficult to learn. Indeed, it is the position of the staff of Task RIFLEMAN that such engagement is not hard to learn. It is felt that if the soldier is provided with an opportunity to experience the difficulties involved in hitting close, approaching targets and if he is allowed the time to learn the performance responses required to

hit such targets, this existing gap in small arms training can be filled.

The time available to hit close and dangerous targets is frequently only a few seconds. Thus, the firer must learn to respond almost immediately upon detecting a target. He must be capable of quickly and smoothly executing a series of responses involving (1) target detection and identification, (2) alignment of his weapon upon the target, and (3) firing weapon. The gaining of control of these responses, the acquisition of a smooth and coordinated performance including proper trigger control, is the objective of training the soldier in close combat firing.

Initiating the response sequence and greatly influencing it is the appearance and behavior of the close target itself. Degree of exposure of close personnel targets is directly influenced by cover and range derived from features of terrain, such as street, jungle, mountain or flat country, woods, etc. While circumstances are infinite, close-personnel target characteristics may be categorized into a few PRINCIPAL RELEVANT VARIABLES:

1. Time of exposure in any single aspect is very brief.
2. Ranges are medium (150 meters) to short (10 meters).
3. At these ranges, target movement is present or imminent, constantly altering the shape, size and position of the target.
4. The alterations are of three general types:

- a. Simple enlargement (target coming straight towards the firer's position)
- b. Angular movement (target moving diagonally to firer, or directly towards a position on his flank)
- c. Sudden change of shape and area (target changes direction)

Search for suitable targets, either in existence now or soon to be available, yielded nothing. The subject device was developed in an effort to express these relevant variables with realism as to enlargement, movement, shape, and area in a rapid sequence which may be repeated as often as desired within the confines of an ordinary firing range. It must be emphasized that true realism, in the sense of life-like human appearance and behavior, has been deliberately ignored as impractical and irrelevant for this device, inasmuch as it is intended to be only a primary trainer for teaching basic techniques. Its functions may be likened to that of the Link trainer in aviation. Thus, the target is not meant to represent an approaching human being per se.

TARGET PRESENTATION

By proper adjustment and installation, all of the principal relevant variables discussed may be presented by this target, in combinations appropriate to the weapon and the skill of the shooter. For enlargement alone, the target can be advanced straight towards

the shooter with no lateral movement. By a simple adjustment it can be made to weave slightly side to side, presenting a constantly changing silhouette and area (see Figure 1). A further adjustment, allowing longer side-to-side sweeps, permits firing at diagonal movement, such as might be present when personnel are dodging from cover to cover. The firing can be complicated by towing the target, with any of the above adjustments, slightly diagonally to the shooter's position, or having him engage the target in an adjacent lane, if the firing fan permits.

Targets can be presented in multiples, either in separate firing lanes, or more closely spaced for engagement of the group by a single firer. The latter should be especially valuable in training for automatic fire.

The targets can be made to appear fleetingly between buildings in a village mock-up, thus adding surprise and more rapid angular motion. The village mock-up is particularly suitable for having two or more targets appear at different points simultaneously. These can be made to go in various directions if desired.

Categories of difficulty can be set up, as well as discrimination of skill at various ranges. Artificial time limits could be imposed, though they are inherent in the target movements and the towing speed. At 10 mph a run of 50 meters is made in approximately 10 seconds.

The target carrier is a very low wheeled vehicle of predominately wooden construction, with few moving parts. Design permits quick

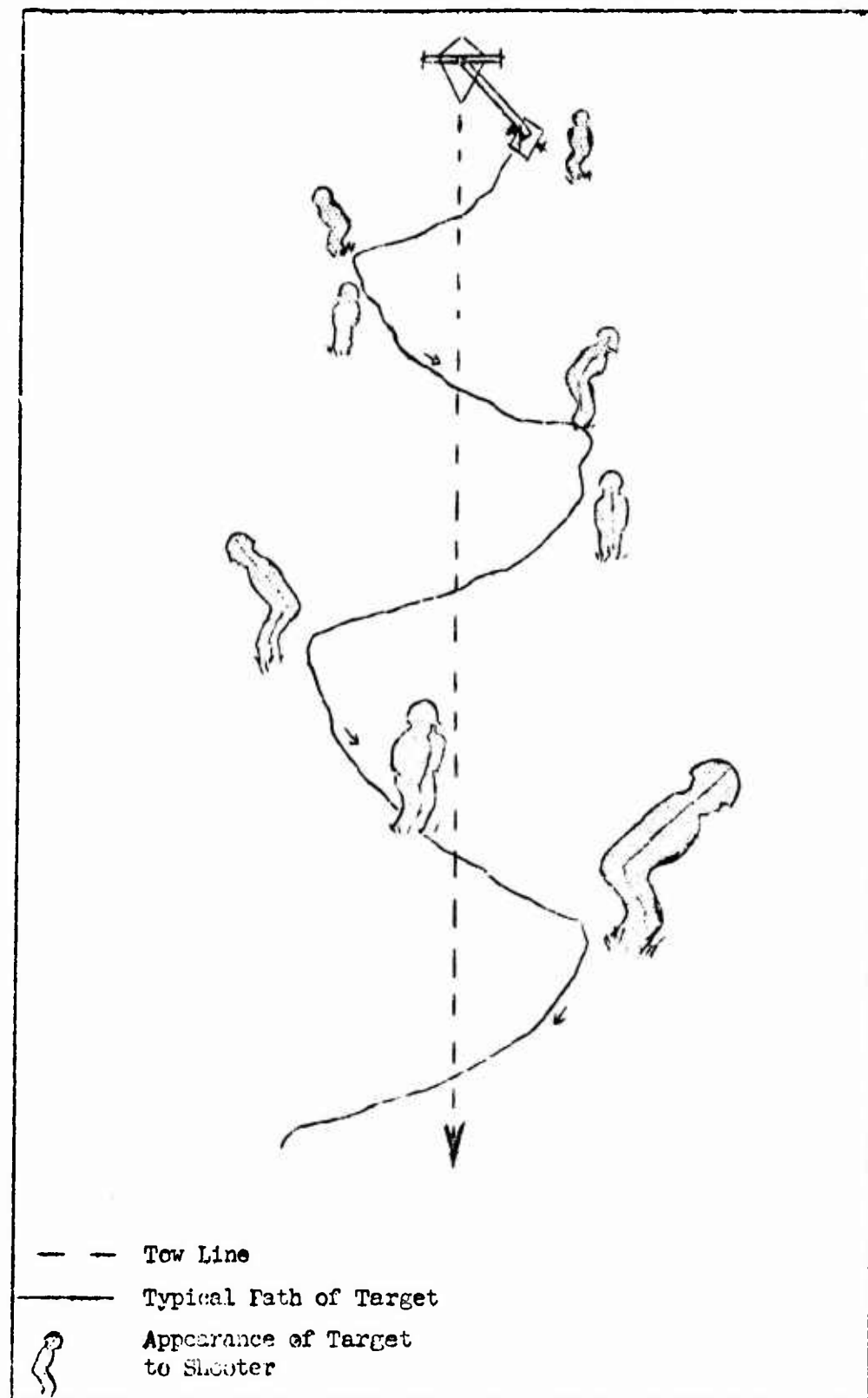


Figure 1. Advancing Small Arms Target

replacement of damaged parts. Materials are readily available, non-critical and inexpensive. Fabrication can be by unskilled labor using ordinary shop and hand tools.

The carrier is towed and pulled back to starting point by means of field wire lying along the ground. By an arrangement of simple pulleys staked to the ground, the tow and pull-back wires can form a closed loop, into which the towing vehicle or winch is inserted, so that both operations are performed by simple reversal of direction. Wires may be laid to permit simultaneous operation of several targets by a single power source (see Figure 2).

Terrain requirements are for a cleared field slightly larger than the actual firing lanes, with appropriate impact fan. It need not be level, but should be free of steep-walled or deep gullies. All solid obstructions such as rocks or roots higher than four inches should be removed from the area where the carriers are to operate. A fringe of natural (or artificial) cover near the firing line, including trees and brush, will not prevent operation and might complicate the firer's problem, if desired. The device will operate satisfactorily on a variety of surfaces, but does not perform well in soft sand and mud, or dense, wet grass over four inches high. It is possible that substitution of skids for the plywood wheels would permit operation under some of these conditions, including that of snow cover.

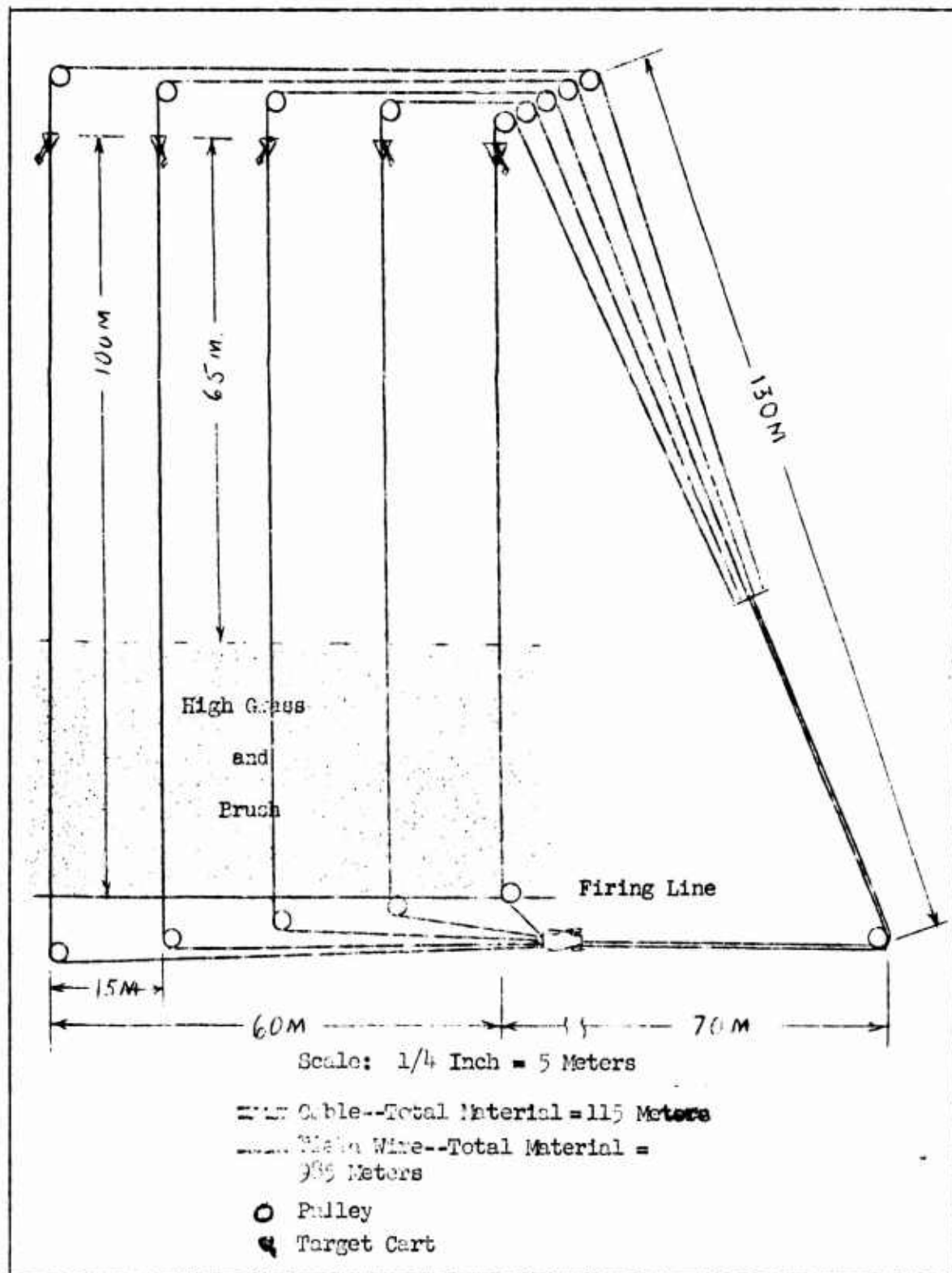


Figure 2. A Possible Five-Target Layout

MECHANICAL DETAILS

The Expendable Silhouette

The expendable three-dimensional silhouette consists of two flat pieces of thin material cut out to represent the front and the side silhouettes of a running man.¹ The front silhouette is slit down the center almost its entire length which permits assembling the two pieces at right angles to each other. They are locked together by inserting a strip of doubled Kraft paper through a slot and stapling it in place. Mounting flaps are folded up at the bottom of the unit.

The silhouette is secured to the demountable target platform by means of two clamping boards of thin plywood laid on top of the flaps and then secured with stove bolts. This completes the silhouette assembly, which may now be mounted on the carrier in a few seconds.

The most satisfactory silhouette material found was 1/4 inch Fome-Cor.² This is a plastic foam in sheet form, faced on both sides with heavy, wet-strength Kraft paper.

The Fome-Cor silhouettes were tested for maintenance of rigidity and strength under abnormal conditions. One silhouette remained operative after receiving 273 rounds of rifle and pistol ammunition deliberately concentrated in critical areas. Another was used during a

¹ See Appendix A for detailed sketches of the target and carrier.

² Fome-Cor type 440-A, manufactured by St. Regis Paper Co., was used in the experiments conducted during development of the target device.

4-hour period of constant, heavy rain. There was some weakening of overall stiffness due to softening of the paper facings, but the target remained usable. The material withstood prolonged vibration and heavy gusts of wind during endurance tests of the carrier.

The Carrier

The low profile wheeled cart or dolly is towed by a wire at ground level. Pivotally attached to this and thrusting forward from it is a swinging arm or beam about 10 feet long. The forward end of the beam is supported by another small wheeled structure or dolly which carries the expendable silhouette. The target dolly is held at maximum angle to the beam, at one side or the other, by a spring.

As the machine is towed forward, the beam swings from side to side across the tow line, imparting a varying lateral motion to the target. A leash line reaching from the main tow line to the forward end of the target dolly limits the swing of the beam, and also reverses the target dolly when this limit is reached. This reverses the silhouette and the direction of travel of the target. The leash may be adjusted to control the amount of lateral excursion from zero (no side excursion) to 6-1/2 feet on each side of the tow line by snapping its forward end in the selected link of a piece of light chain let into the tow line. When a forward run is completed the device is drawn back to the starting position by a trailing pullback wire.

Endurance tests conducted with prototype devices consisted of towing carrier and silhouette back and forth over grassy and sandy level

terrain. The final model was given 25 miles of such towing, with only minor evidence of wear.

Ground Installations

The net terrain requirements are the depth desired by a width composed of the sum of the firing lanes plus the distance the target is to be towed. Thus, a 100-meter range of five 15-meter firing lanes, targets to be advanced from the 100-meter to the 35-meter line, would require terrain of a depth of about 125 meters and width of 5 times 15 plus 65 meters, total about 150 meters, allowing a little extra for installation.

US Army Wire, Field, Communications, WD-1/TT was found satisfactory for towing one or two targets. For heavier loads it is suggested that individual tow wires be consolidated into a single tow cable, as shown in Figure 2.

Any pulleys over six inches in diameter will work effectively. Fastening them to a plywood or metal plate which may be spiked to the ground was found to keep dirt out and give good operation. Keepers or guides should be large enough to allow passage of knots or splices. Removable guides will assist in rapid layout by avoiding the necessity of reeving the wires through the pulleys from the end.




SUMMARY AND CONCLUSIONS

An approaching small arms target was developed to rapidly and realistically express the changes in shape, size and position of a target in close combat.

In addition to the specific training problems for which it is designed, it appears that a variety of training exercises could be based on this target, not only for initial training but for maintenance of skill in remote places where informal means must be improvised.

The device is being released before it has been used extensively in the hope of stimulating thinking about its employment in other problems for which it might be suited.



APPENDICES

APPENDIX A

SKETCHES

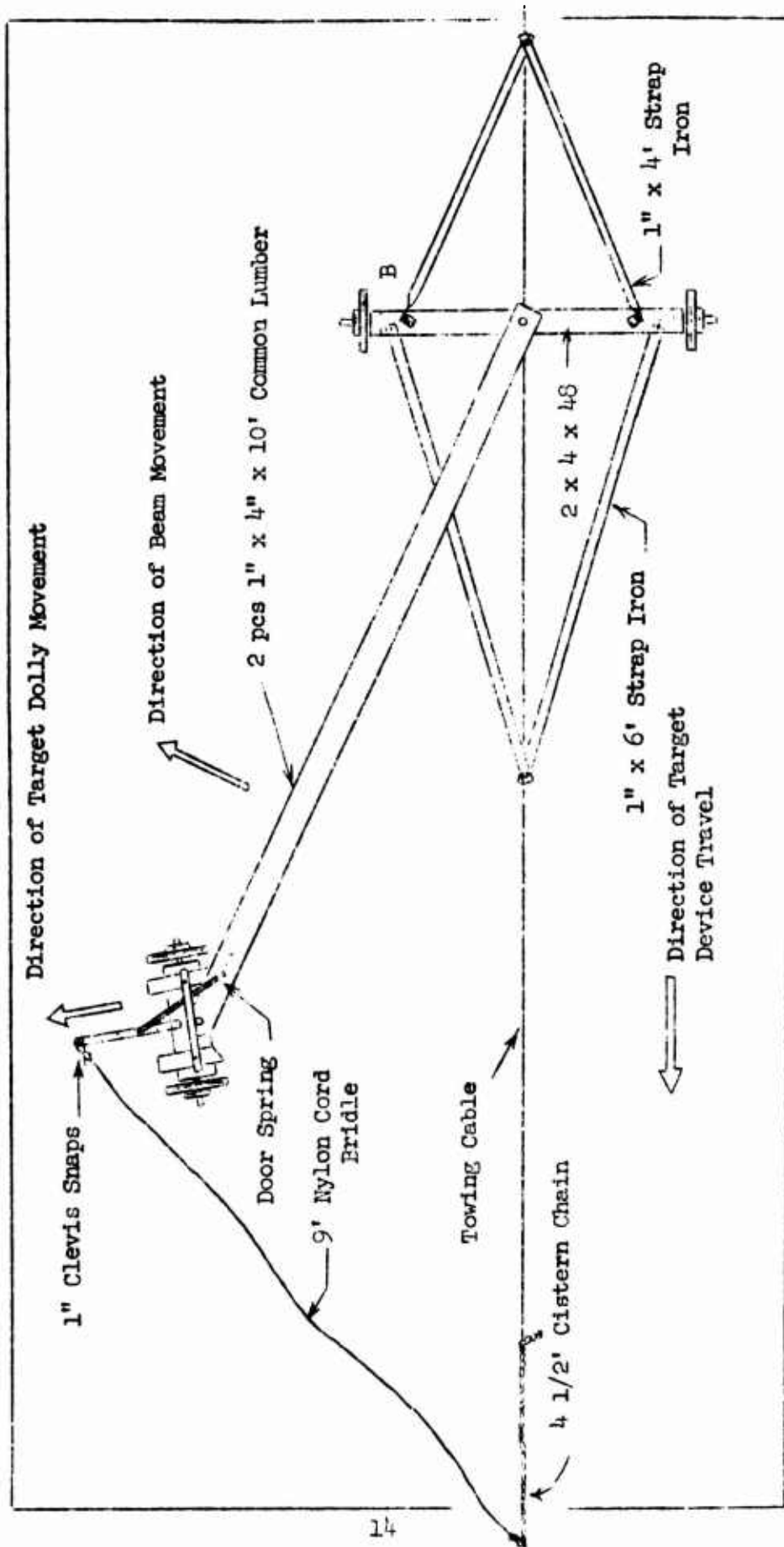


Figure A-1. Advancing Small Arms Target Device

Appendix A

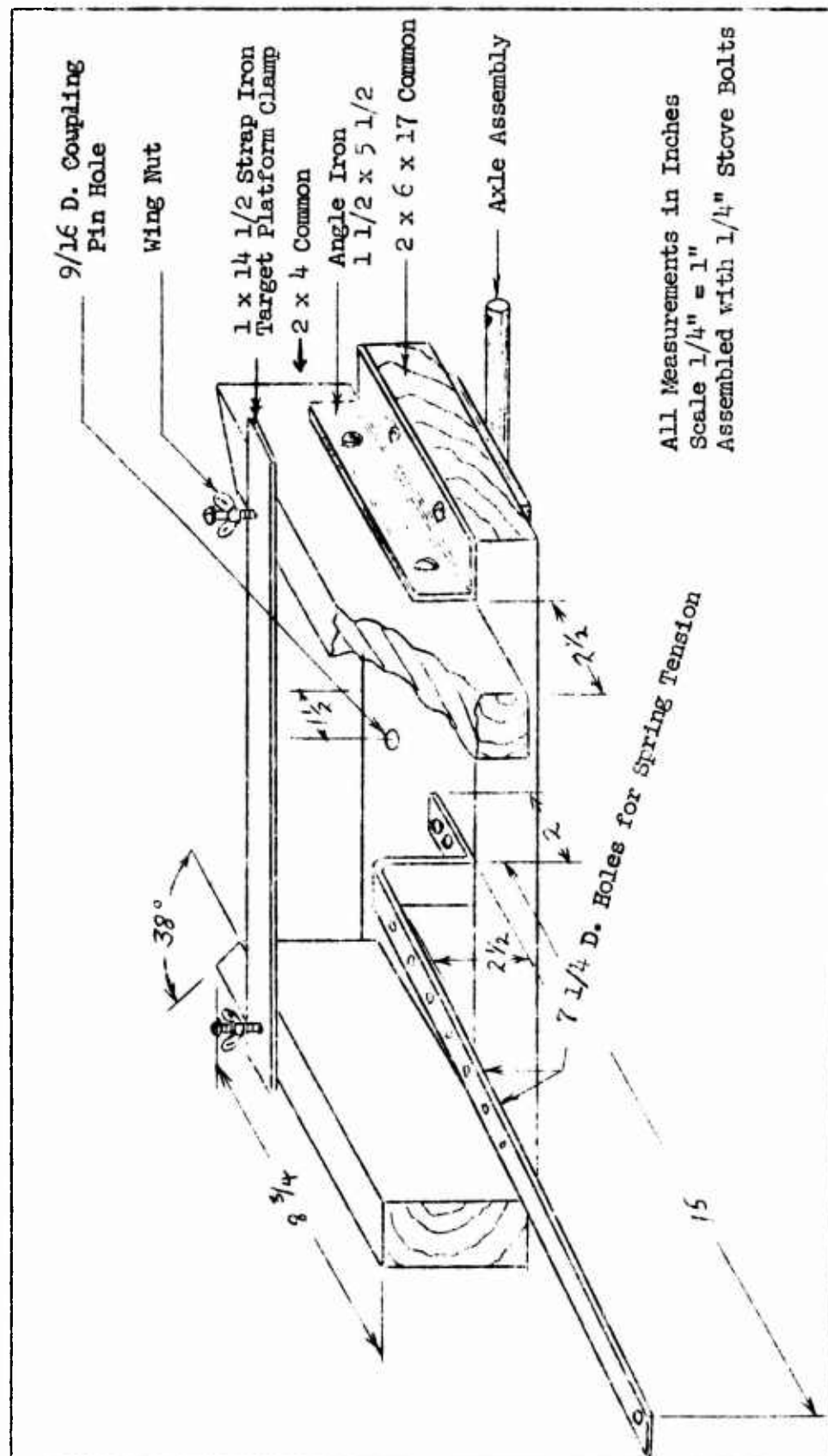


Figure A-2. Target Dolly

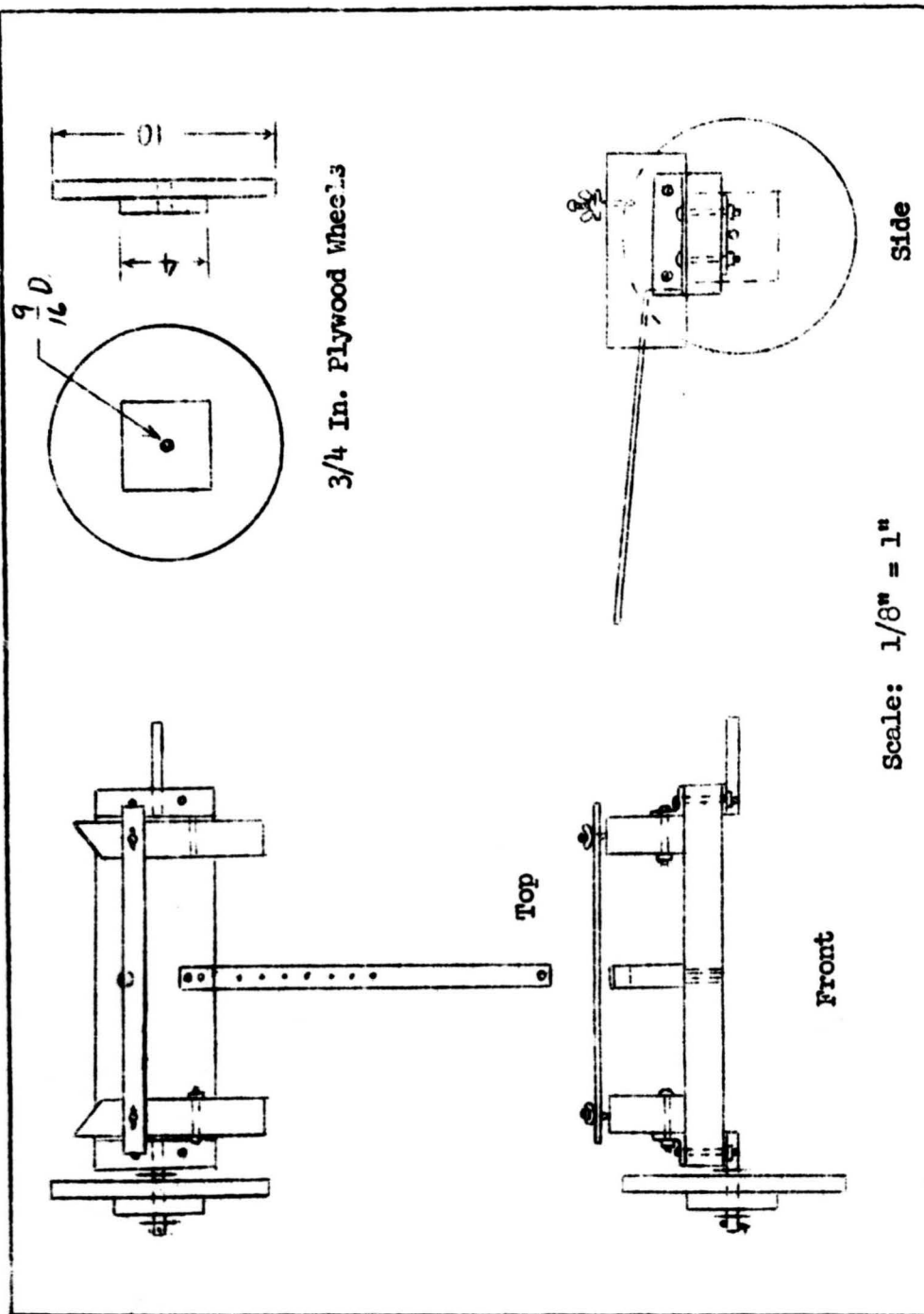


Figure A-3. Target Dolly

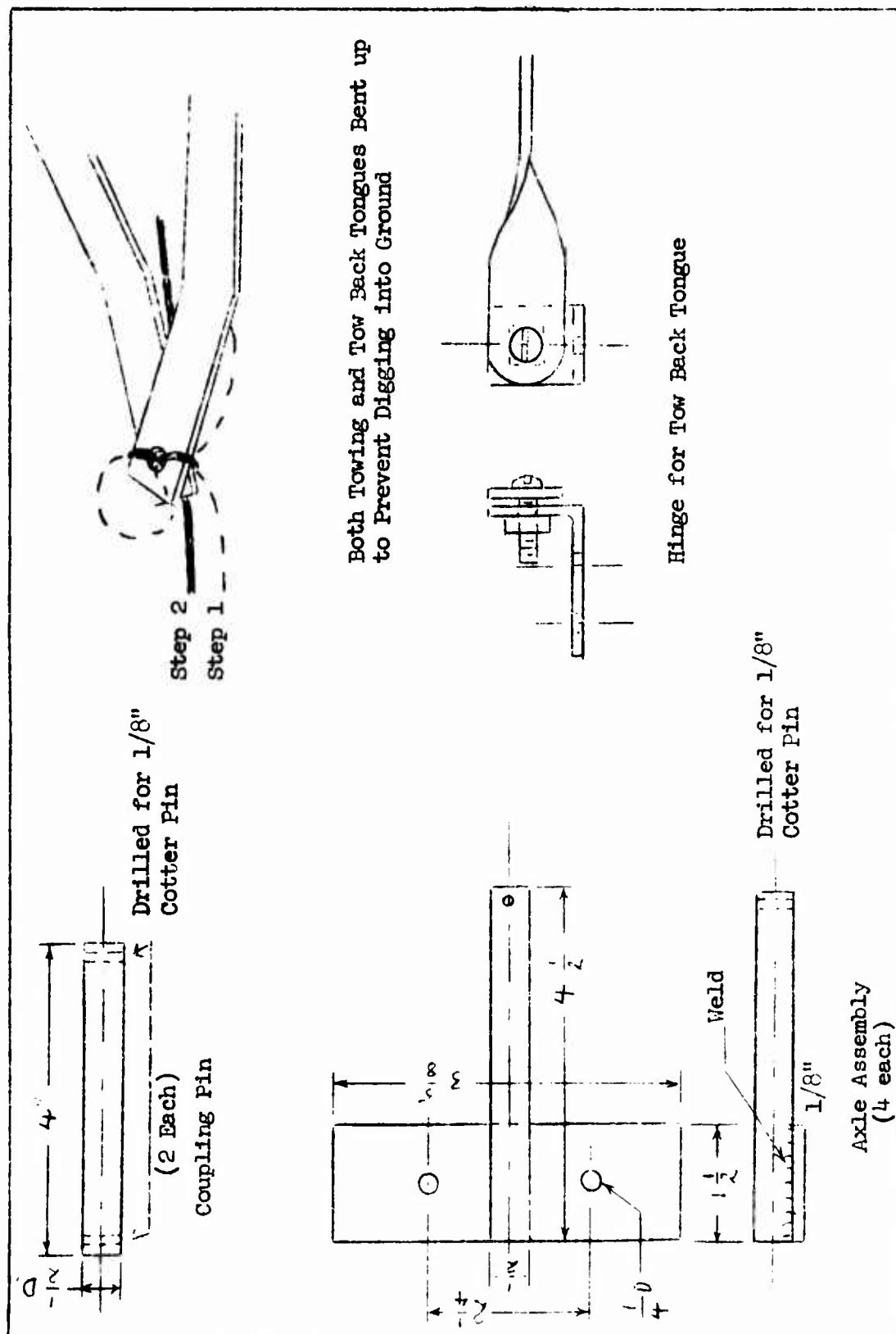


Figure A-4. Construction Details

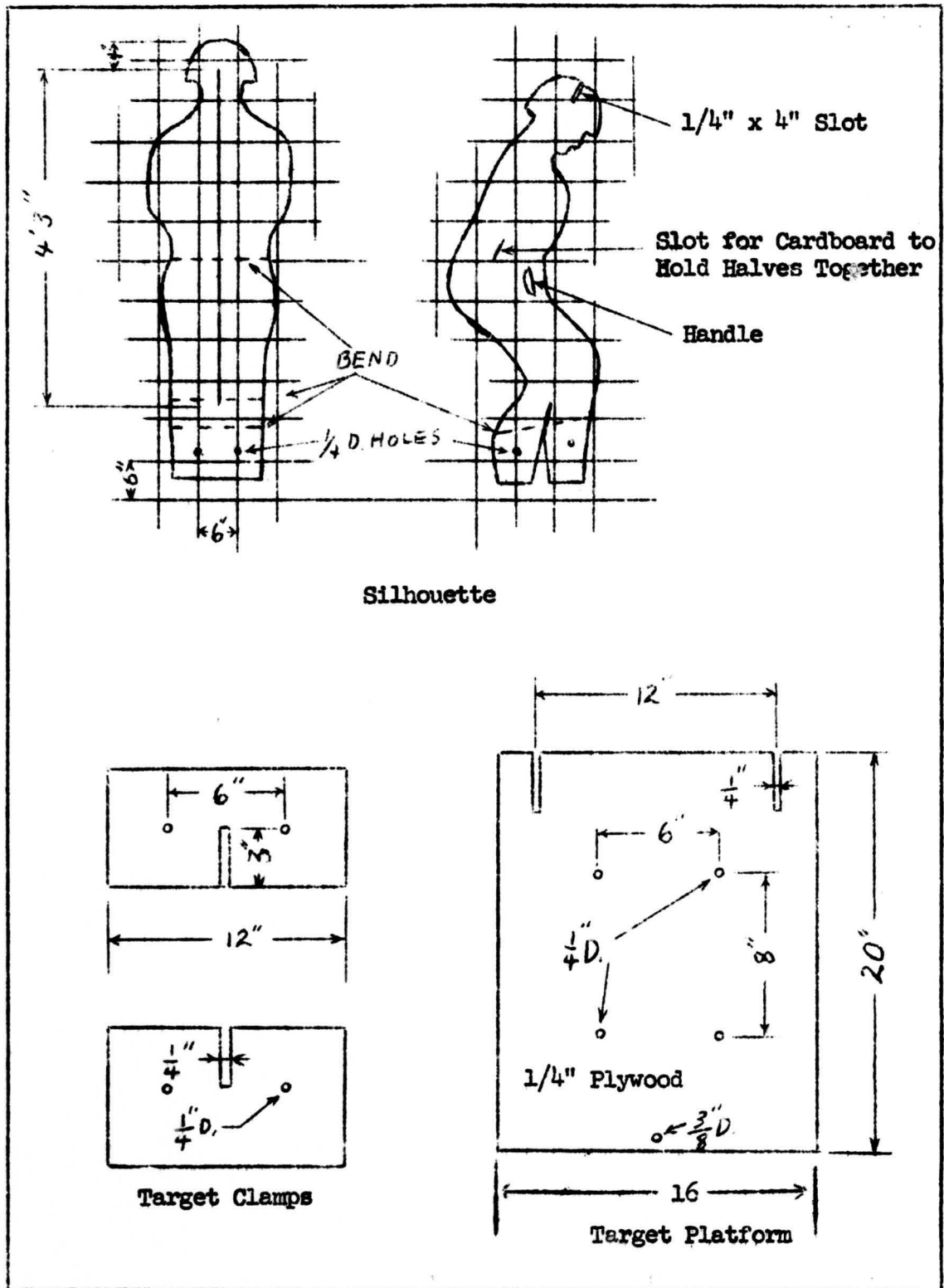


Figure A-5. Target Details

APPENDIX B
BILL OF MATERIALS

Appendix B

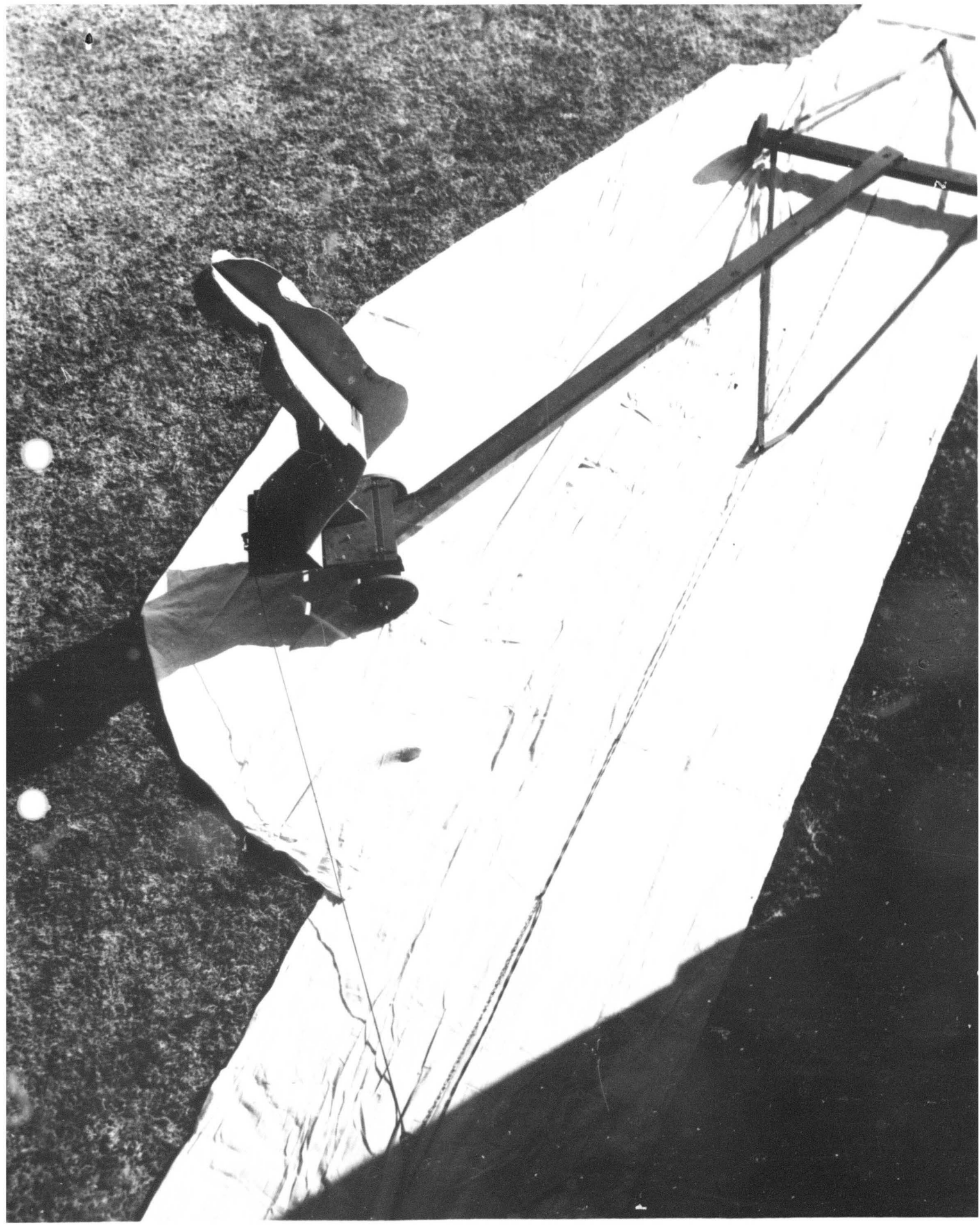
BILL OF MATERIALS

<u>Item</u>	<u>Quantity</u>	<u>Description</u>
1.	24 linear feet	1/8" x 1" flat steel
2.	1-1/3 linear feet	1/8" x 1 1/2" flat steel
3.	1-1/4 linear feet	1/8" x 1 1/2" angle iron
4.	2 linear feet	5/8" steel rod
5.	8 linear inches	1/2" steel rod
6.	5 linear feet	2" x 4" dimension
7.	1-1/2 linear feet	2" x 6" dimension
8.	2 pieces	1" x 4" x 10' common lumber
9.	4 square feet	3/4" plywood
10.	3-1/2 square feet	1/4" plywood
11.	1	3/8" screen door spring
12.	1 dozen	5/8" washers
13.	1 dozen	1/8" x 1 1/2" cotter keys
14.	2 dozen	1/4" x 2" round head stove bolts
15.	1/2 dozen	1/4" x 1" round head stove bolts
16.	2 dozen	6 d nails
17.	1/2 dozen	1/4" wing nuts
18.	2	1" clevis snaps
19.	10 foot length	1/4" nylon parachute shroud
20.	24 square feet	Fome-Cor 440-A
21.	6 foot length	Cistern chain

APPENDIX C
PHOTOGRAPHS

Appendix C

Figure C-1
Top View of Target Device Showing
Operation of Tow Line



Appendix C

Figure C-2

The Advancing Small Arms Target
as Presented to the Shooter

